

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

A Front Tracking Method for the Investigation of the Electrohydrodynamic Instability Between Two Immiscible Fluids¹ ILKE KAYKANAT, Bogazici University, METIN MURADOGLU, Koc University, KEREM UGUZ, Bogazici University — When an electric field is applied to the flat interface between two immiscible liquids flowing in a microchannel, the interface can be deflected and microdroplets can be obtained. In this study, a front-tracking method is presented for direct numerical simulations of two-phase systems to study the effects of the electric field applied normal to the flat interface between two immiscible, Newtonian fluids. The method is developed using a one-field formulation of the governing equations. The interface is tracked explicitly using a Lagrangian grid and the flow equations are solved on a fixed Eulerian grid. The effects of the applied voltage, the viscosity, and the base-flow strength on the nonlinear evolution of the interface are studied. Furthermore, in this study, the results obtained by the interface tracking method will be compared with the results obtained by both long-wave analysis and the experimental results obtained in our group.

¹BAP Project No: 15441

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Date submitted: 31 Jul 2019

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